

THE PERFORMANCE OF SELF-CHECKOUTS

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ABSTRACT

Self-checkouts at retail stores help improve customer satisfaction by reducing waiting times of customers. However, there should be more quantitative analyses of supporting the presumption that self-checkouts actually decrease average waiting times at checkout to achieve their goals. This study aims to estimate waiting times of customers via simulation through simulation using the point of sales data from an existing literature. We found that self-checkout counters have longer transaction times though they scan a smaller number of items than cashiers. We also observed that, under a certain setting, the waiting times at self-checkout lanes can be shorter than those at cashiers.

Keywords: Self-checkout, Waiting time, Service at Retailers, Simulation.

INTRODUCTION

In most large retail stores, we can easily see self-checkout lanes along with regular staffed-checkout counters. Those stores have aimed to enhance checkout service with self-checkout lanes so that customer satisfaction and loyalty to the stores will be achieved. Several studies (e.g., Djelassi et al. (2018), Meuter et al. (2000), and Anitsal and Fairhurst (2002)) found that satisfaction with self-checkout leads to customer satisfaction with the store. Thus, checkout service has been one of the important operations provided by retail stores. According to a survey conducted by Forrester Consulting, 65% of grocery shoppers choose self-checkout lanes as a means of avoiding slow checkout (eMarketer, 2018).

Despite a well-received choice to using self-checkouts, it has not been clearly demonstrated whether the self-checkout lanes actually reduce waiting time of customers. Some people argue that self-checkout is expensive and minimizes neither transaction speed nor number of customers in line (Juntti, 2014). On the other hand, self-checkout is also claimed to be effective at reducing perceived waiting time (Morimura & Nishioka, 2016). Maister (1985) explained the discrepancy between customers' actual waiting time and perceived waiting time as psychology of waiting lines.

In this study, we analyze the waiting time through simulation because the waiting time reveals significant effects on customer service (Durrande-Moreau, 1999). As consumers' waiting time perceptions are driven by actual checkout waiting time (Anic et al., 2011), the actual waiting time can be an appropriate measure to be analyzed for evaluating performance of self-checkouts.

SIMULATION

We developed a simulation model for this study. We assume that the customers arriving for checkout services join either the queue for cashiers or the queue for self-checkouts. Our model assumes that cashiers and self-checkouts have their own one waiting line. According to Schimmel (2013), there is no significant difference in waiting time between a system with one combined queue and another system with a separate queue at each counter. If there is an available self-checkout machine when a customer arrives for a checkout service, the customer will be served right away by one of any available servers. Otherwise, customers are being served on a first-come first-serve basis. Based on the open data from

Antczak & Weron (2019), we determine the simulation parameters. We have modified the parameters for analytic convenience and this simulation setup is sufficient enough to investigate the factors influencing on the waiting times of the customers at both checkout types.

SIMULATION RESULTS

We have obtained the simulation results of waiting times and defined a measure “Ratio” as the number of self-checkout counters that have shorter waiting times than cashiers divided by the total number of checkout lanes for a certain group of parameter combinations. Under the current simulation setup, in about 32% of the total 300 cases, the customer waiting times are shorter at self-checkout lanes than with cashiers and the mean Average wait time is about 4.796 seconds.

When only 20% of the arriving customers select self-checkouts, the waiting times at self-checkout lanes are shorter than those at cashiers in 70% of the total cases. When 40% of the customers use self-checkouts, the Ratio has dropped to 0.0833. This result is not so surprising because the chances that self-checkouts have shorter waiting times seem lower when the self-checkout lanes are more crowded. Average wait time is observed to be increasing with respect to the percentage of self-checkout lanes. Average transaction time is longer at self-checkout, the overall waiting times will be longer if there are more customers using self-checkouts.

Our simulation results also indicated that the more customers arrive, the longer the average wait time is. It seems intuitive because the simulation setups are the same except for arrivals and it becomes more crowded if arrivals are higher. The simulation results imply that self-checkouts may be more useful when there are more customers for checkout services in a unit time than when there are less arrivals.

Average wait time at the cashier lanes was shorter if there are more cashiers when all others being equal. Although, it is notable that the decreasing magnitude also decreases, which means we may not reduce the customers waiting time dramatically by hiring more cashiers. As the stores can reduce waiting times at cashiers by having more cashiers, it appears ordinary the chances that self-checkouts have shorter waiting times decrease with the number of cashiers.

When there are more self-checkout lanes, it is more likely that the customers using self-checkouts wait shorter than those served by cashiers. In addition, Average wait time decreases as the number of self-checkouts increases. However, again, the decreasing magnitude also decreases and we might guess that adding significantly more self-checkout lanes would not help radically reducing overall Average wait time.

CONCLUSION

We have conducted a simulation study in order to investigate waiting times of customers at checkout. The simulation results using the point of sales data from an existing literature showed that self-checkout counters have longer transaction times though they scan a smaller number of items than cashiers. We observe also that, the waiting times at self-checkout lanes can be shorter in a certain setting than those at cashiers. The self-checkout lanes can be more useful when a smaller portion of customers prefer self-checkouts.

There are some limitations that can be overcome in future studies. We did not take into consideration that the transaction time may be proportional to the number of items sold, which is highly likely. In addition, we didn't incorporate cost information regarding self-checkout machines or wage of cashiers. Our further research is exploring those limitations. Then, retail stores can get more meaningful managerial insights on dealing with self-checkout counters in practice.

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